Syndromic Surveillance in practice: New York City

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Definitions

Traditional notifiable disease surveillance

- Relies on laboratory/clinician reporting
- Significant diagnostic and reporting delays

"Syndromic" surveillance

- Tracking non-specific symptoms or health "events" (sale of diarrhea medication)
- "Real time" (within hours)

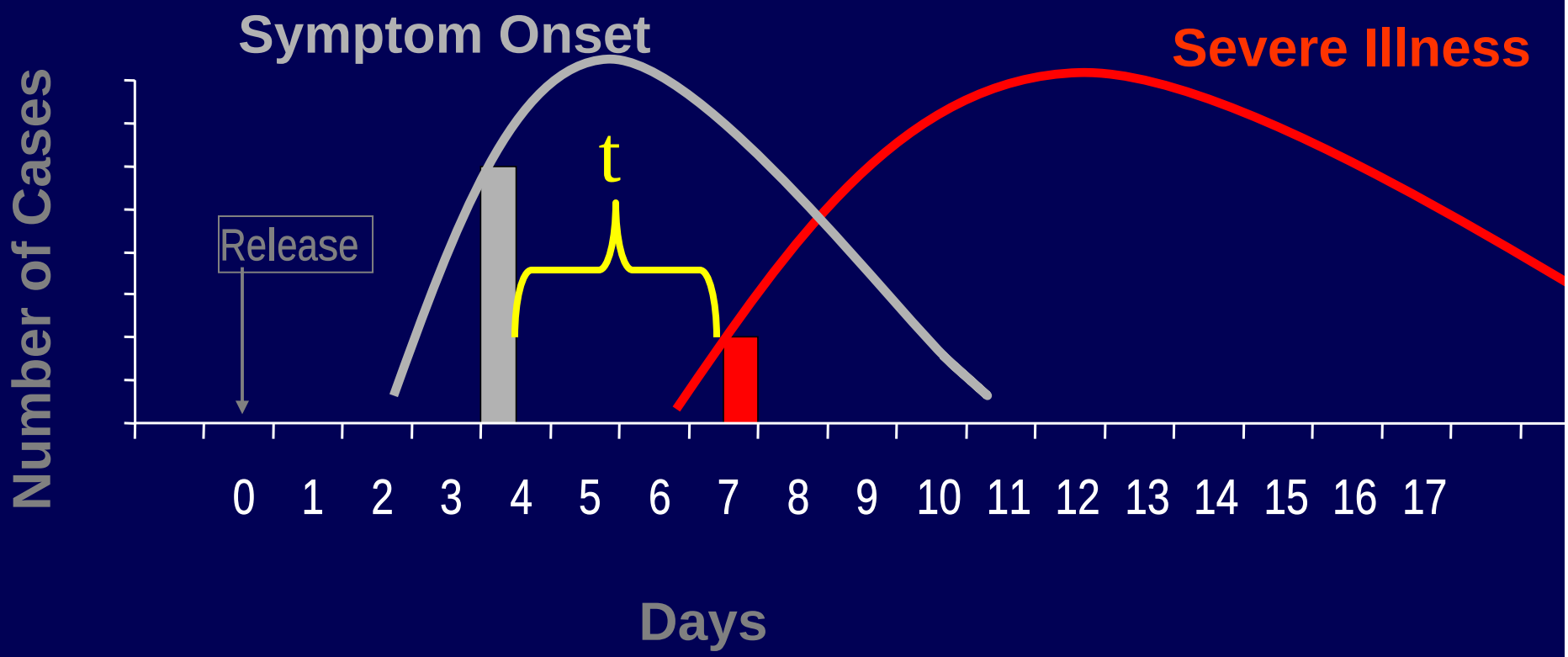
What is Syndromic Surveillance?

- "Real-time" public health surveillance using data that is routinely collected for other purposes
  - Non-specific health indicators
  - Uses existing data
  - "Real time" transmission, analysis, and alerts
  - New analytical techniques needed

Goals

- Early detection of large outbreaks
- Characterization of size, spread, and tempo of outbreaks once detected
- Monitoring of disease trends

Assumptions (Bioterrorism Detection)



Data sources for early detection of acute illness

Day 0 - exposure occurs

Day 1 - feels fine

Day 2 - headaches, fever-

Day 3 - develops cough

Day 4 - sees pr

Day 5 - worsens- call

see

Day 6 - admitted- “pneumonia”

Day 7 - critically ill- ICU, lab tests +

Day 8 - expires- “respiratory failure”

Pharmaceutical Sales

Nurse’s Hotline

Outpatient Visit Data

Absenteeism

Ambulance Dispatch (EMS)

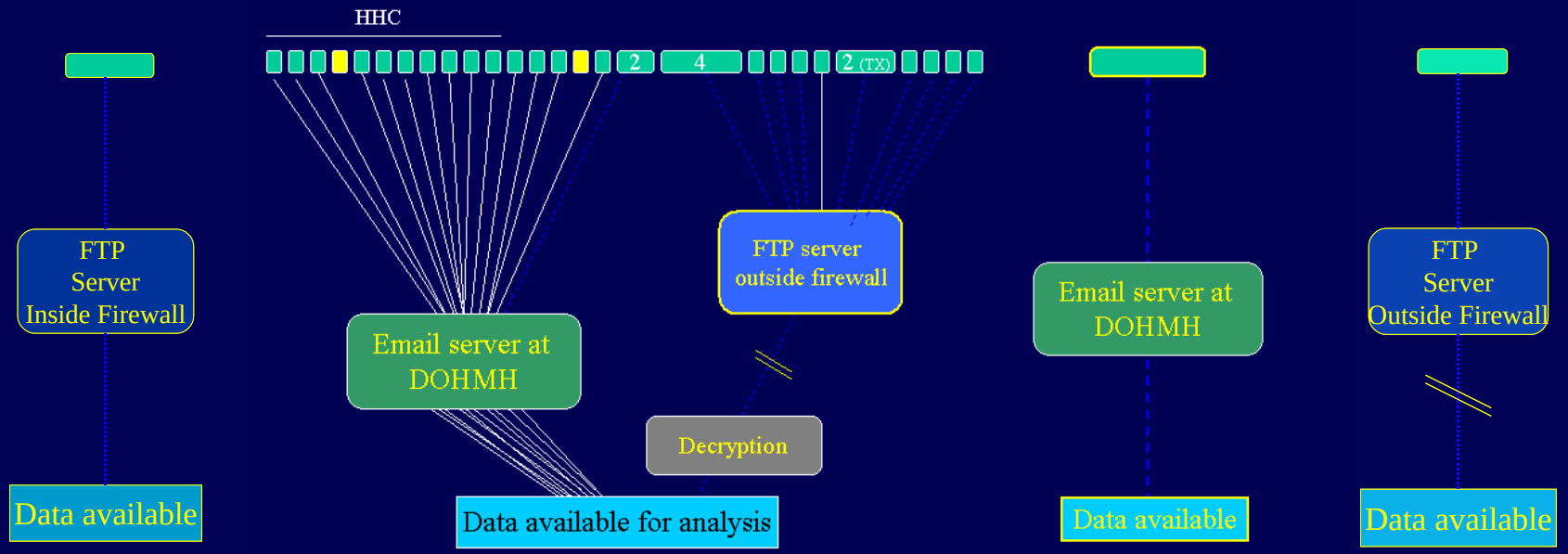
ED Logs

Diagnosed

Reported

Data Transfer

EMS Emergency Department Absenteeism Pharmacy

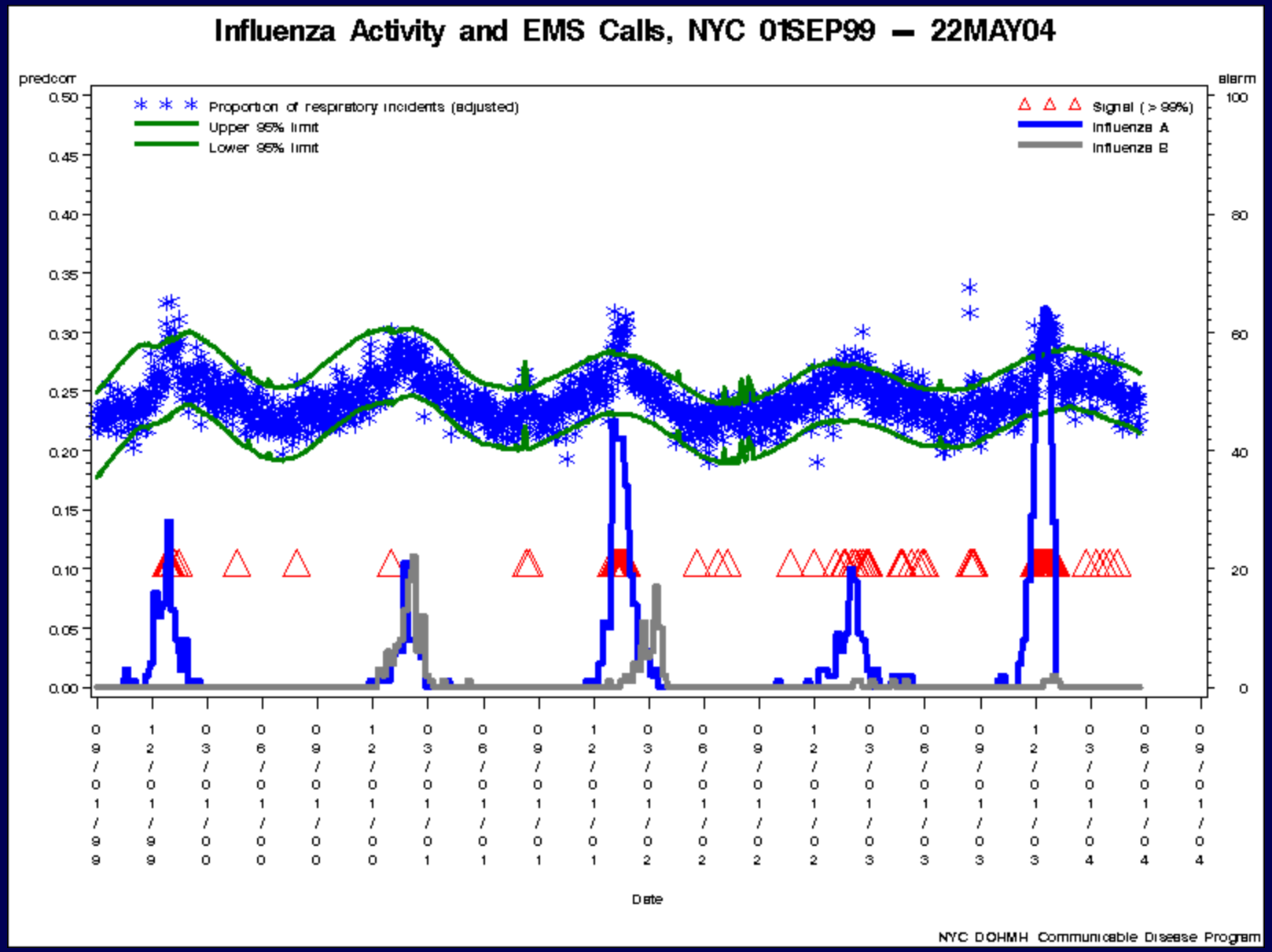


EMS-911 surveillance

Date	Time	Call-type	Zip
09/06/99	**13:09:19**	**SICK**	**10013**
09/06/99	**11:09:57**	**UNC**	**11220**
09/05/99	**09:09:12**	**SEIZR**	**10458**
09/05/99	**08:09:22**	**RESPIR**	**10025**
09/04/99	**11:09:52**	**ABDPN**	**11434**

Influenza-like illness

RESPIR, DIFFBR, SICK, SICPED


Influenza Activity and EMS Calls, NYC 01SEP99 – 22MAY04
predcorr
alarm
Proportion of respiratory incidents (adjusted)
Upper 95% limit
Lower 95% limit
Signal (> 99%)
Influenza A
Influenza B
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
100
80
60
40
20
0
09/01/99
12/09/99
03/10/00
06/06/00
09/02/00
12/03/00
03/06/01
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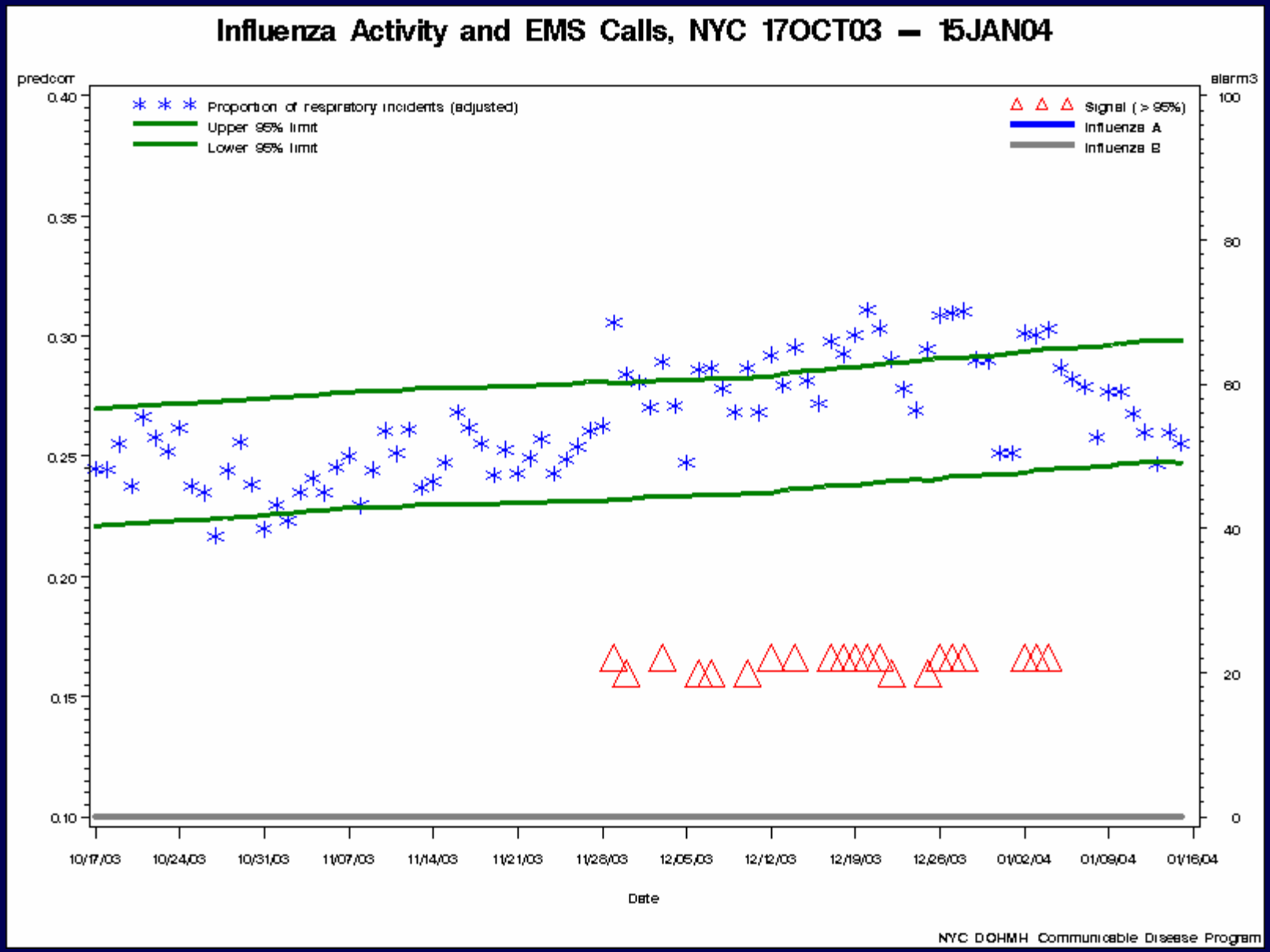
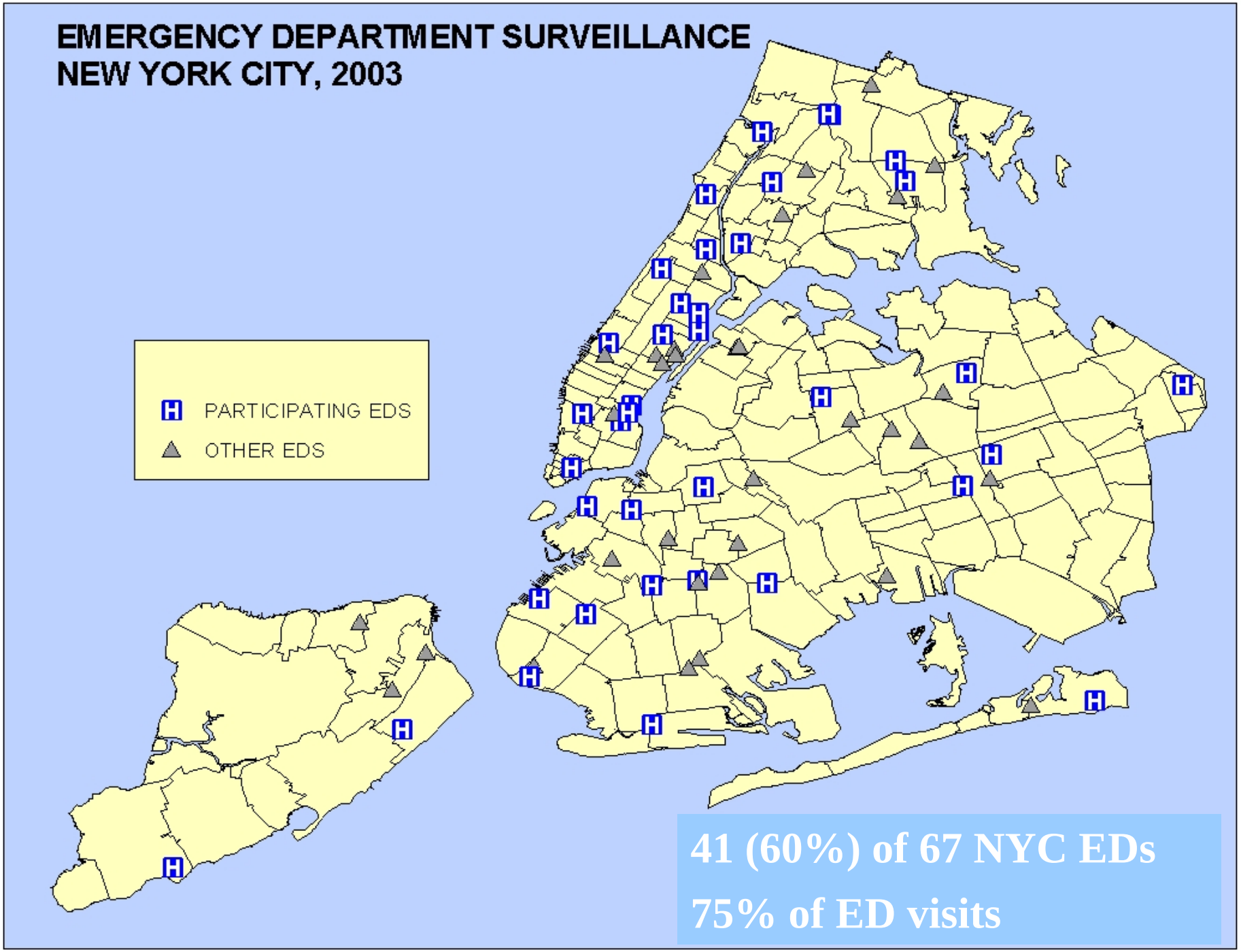
Date
NYC DOHMH Communicable Disease Program


Influenza Activity and EMS Calls, NYC 17OCT03 – 15JAN04
predcorr
alarm3
Proportion of respiratory incidents (adjusted)
Upper 95% limit
Lower 95% limit
Signal (>95%)
Influenza A
Influenza B
0.40
0.35
0.30
0.25
0.20
0.15
0.10
100
80
60
40
20
0
10/17/03
10/24/03
10/31/03
11/07/03
11/14/03
11/21/03
11/28/03
12/05/03
12/12/03
12/19/03
12/26/03
01/02/04
01/09/04
01/16/04
Date
NYC DOHMH Communicable Disease Program

EMERGENCY DEPARTMENT SURVEILLANCE
NEW YORK CITY, 2003



41 (60%) of 67 NYC EDs

75% of ED visits

Electronic ED logs

Admission List For 01/28/2002

AGE	SEX	TIME	CHIEF COMPLAINT	ZIP
15	M	01:04	ASSAULTED YESTERDAY, RT EYE REDDENED.	11691
1	M	01:17	FEVER 104 AS PER MOTHER.	11455
42	F	03:20		11220
4	F	01:45	FEVER, COUGH, LABORED BREATHING.	11507
62	F	22:51	ASTHMA ATTACK.	10013
48	M	13:04	SOB AT HOME.	10027
26	M	06:02	C/O DIFFICULTY BREATHING.	
66	M	17:01	PT. MOTTLED AND CYANOTIC.	10031

- 4% of records have missing or uninformative chief complaint (Eg. ‘See Triage’, ‘Walkout’, ‘N/A’ etc.)

Coding chief complaints into syndromes

Respiratory illness

key words: cough, shortness of breath, URI, pneumonia

excludes: cold symptoms

Non-specific febrile illness

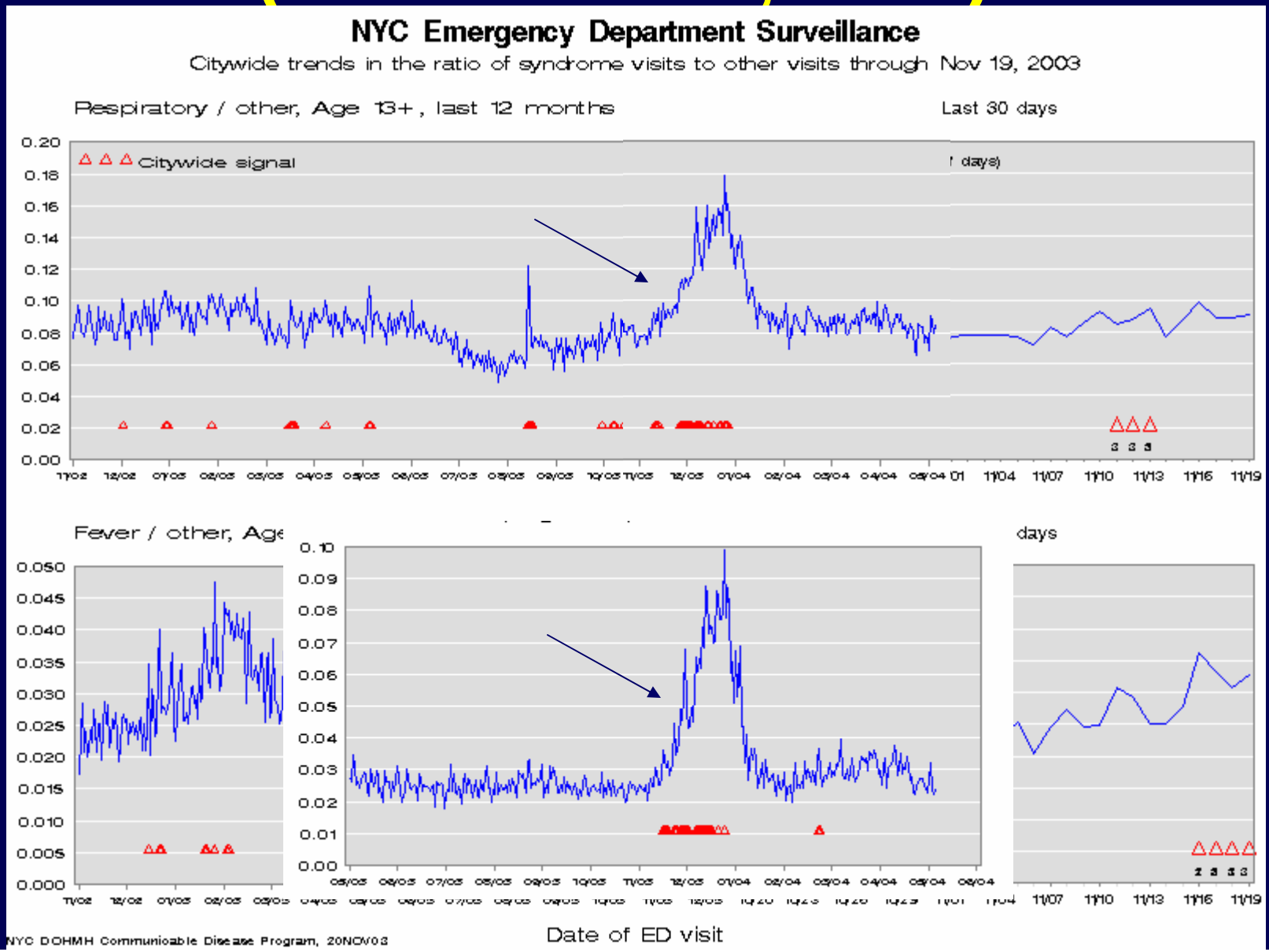
key words: fever, chills, body aches, flu/influenza, viral syndrome

Gastrointestinal illness

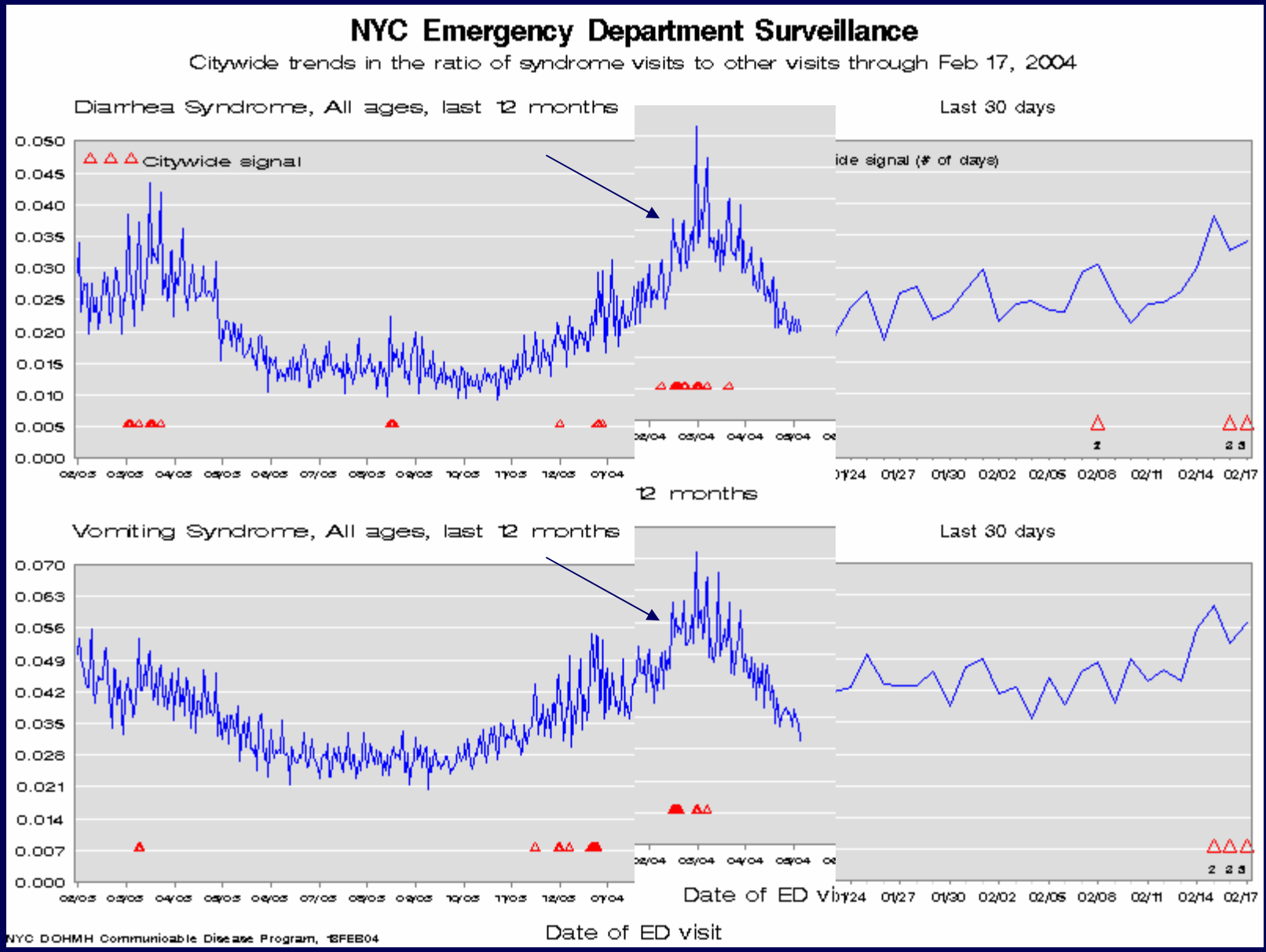
key words: diarrhea, vomiting

excludes: abdominal pain alone, nausea alone

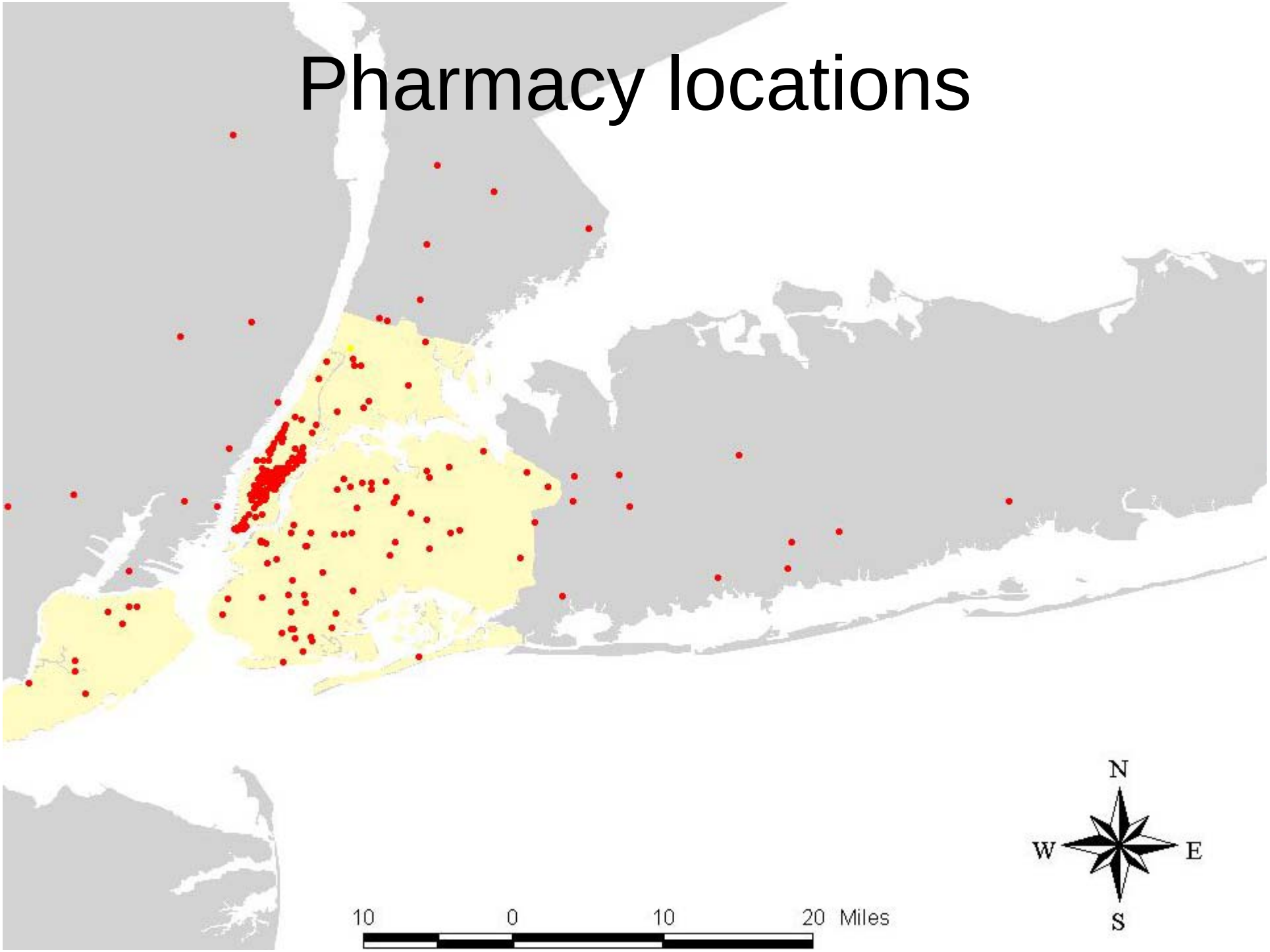
Daily Reports: Resp/ Fever (November 19, 2003)



Diarrhea/Vomiting (Feb 18, 2004)



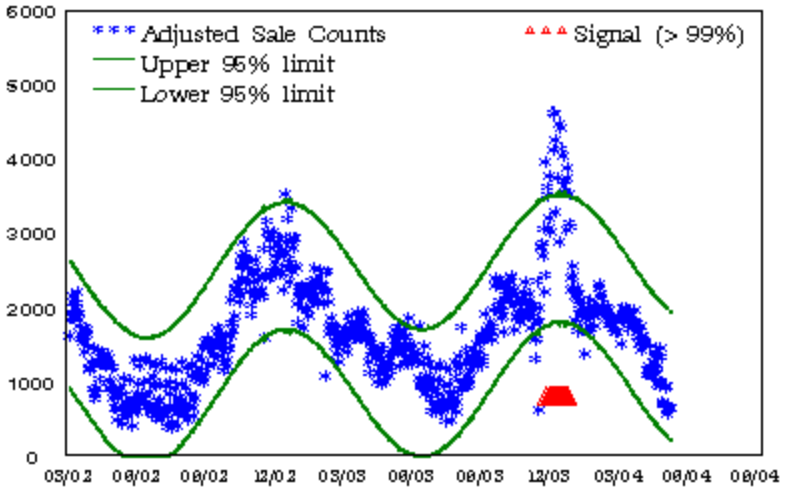
Pharmacy locations



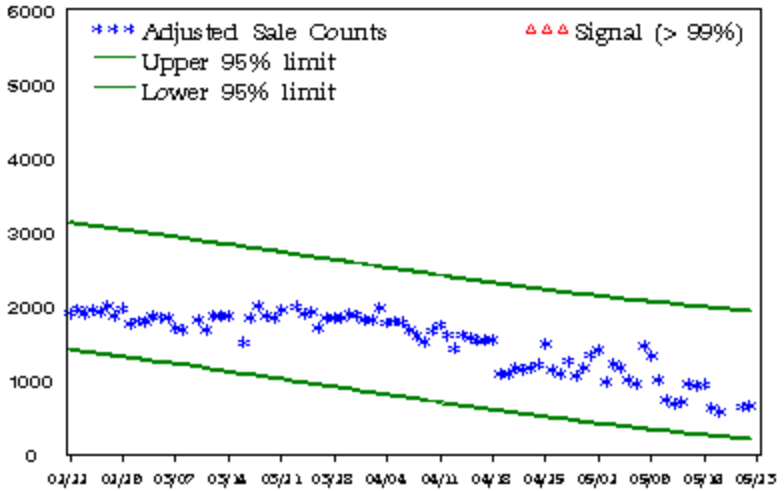
NYC Surveillance for Pharmacy Over The Counter Sales

Citywide Flu-like Med Sales through 22MAY04

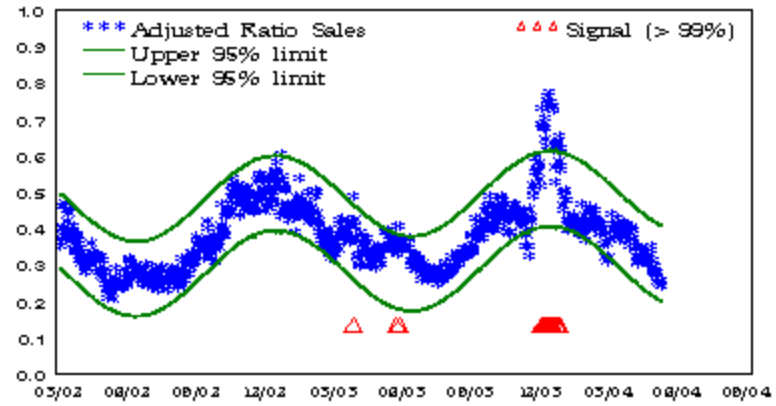
Flu-like Meds



Flu-like Meds, past 3 months



Ratio Flu/Analgesics



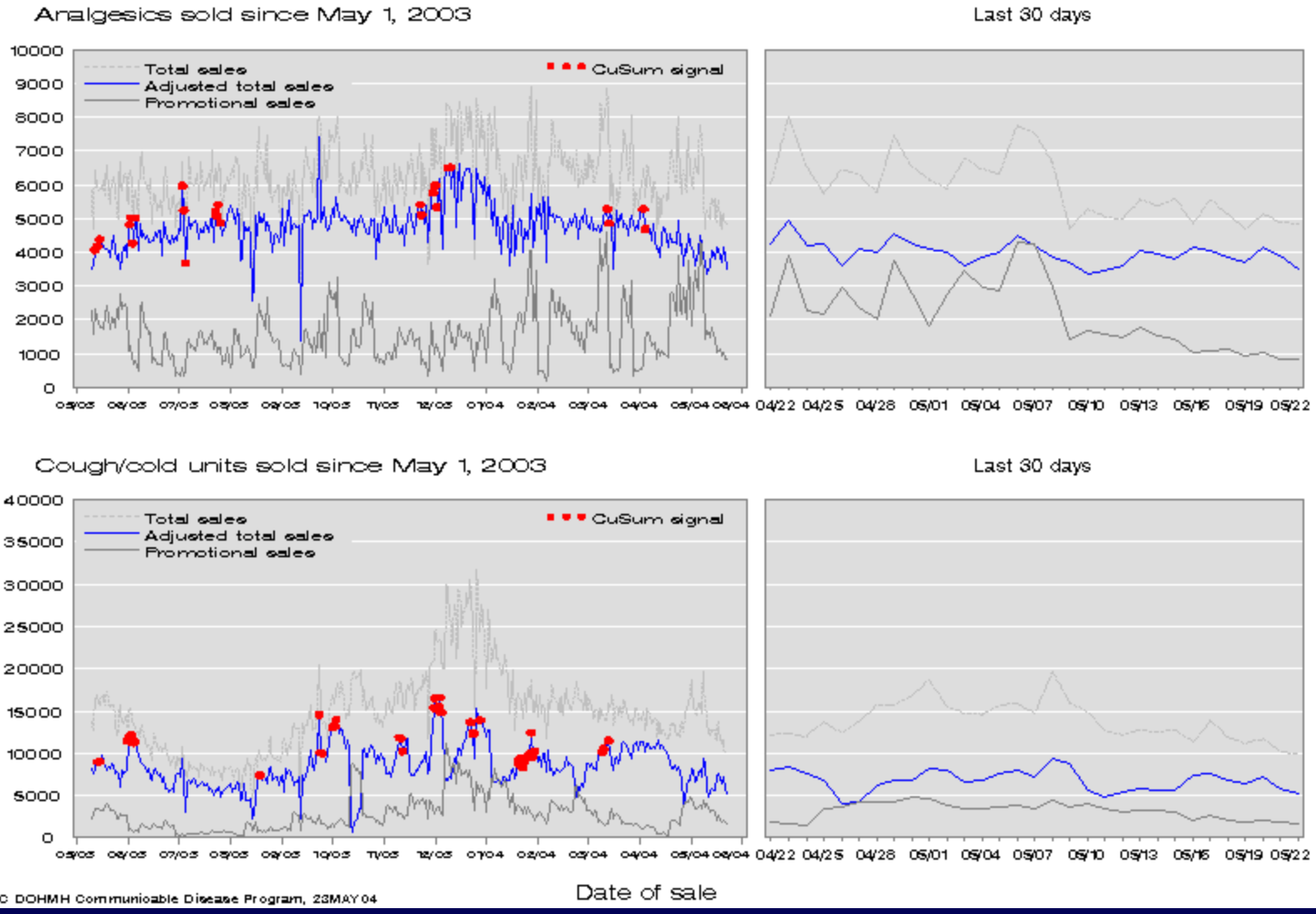
Ratio Flu/Analgesics, past 3 months

NYC DOHMH Communicable Disease Program, 22MAY04

Date of Sale

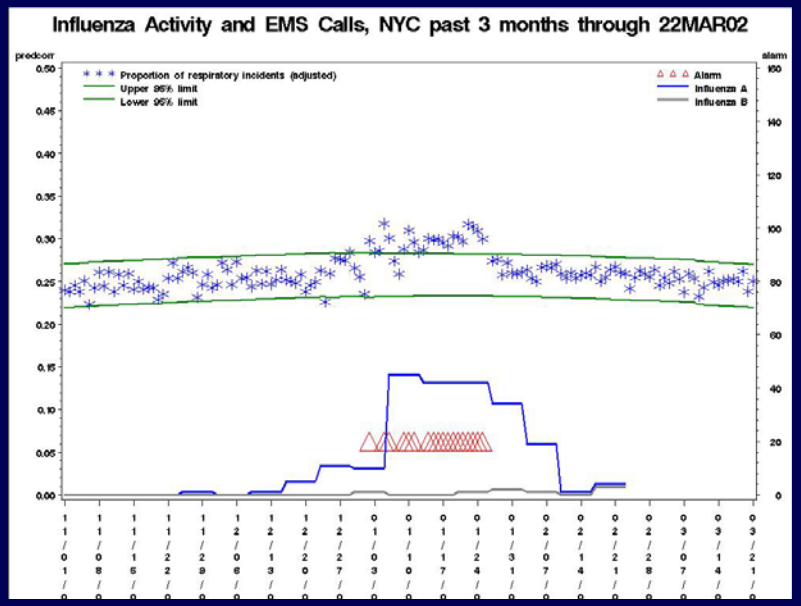
RODS/NRDM OTC Pharmacy Sales

Citywide trends in adjusted total units sold through May 22, 2004

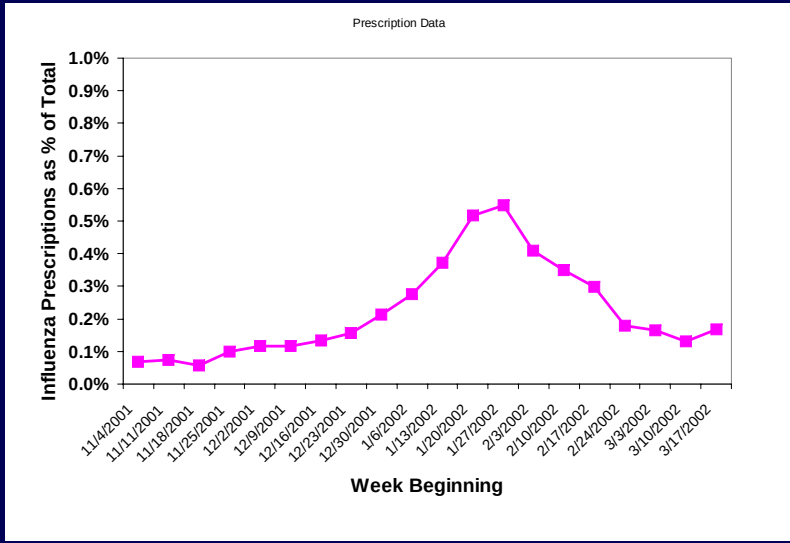


NYC DOHMH Communicable Disease Program, 23MAY04

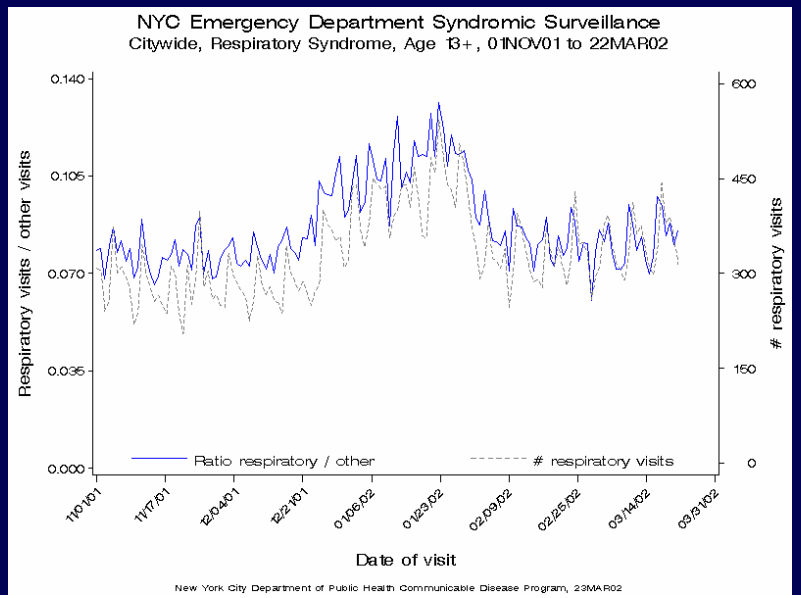
EMS calls



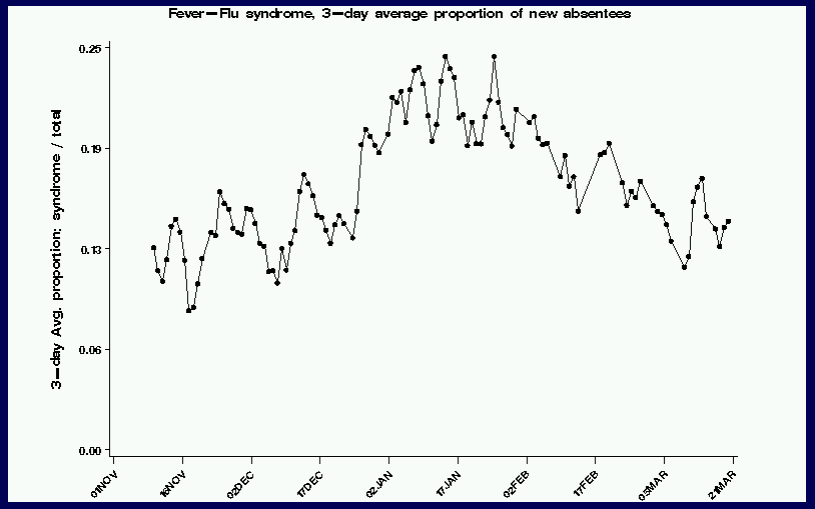
Pharmacy Antiviral Rx



ED respiratory visits

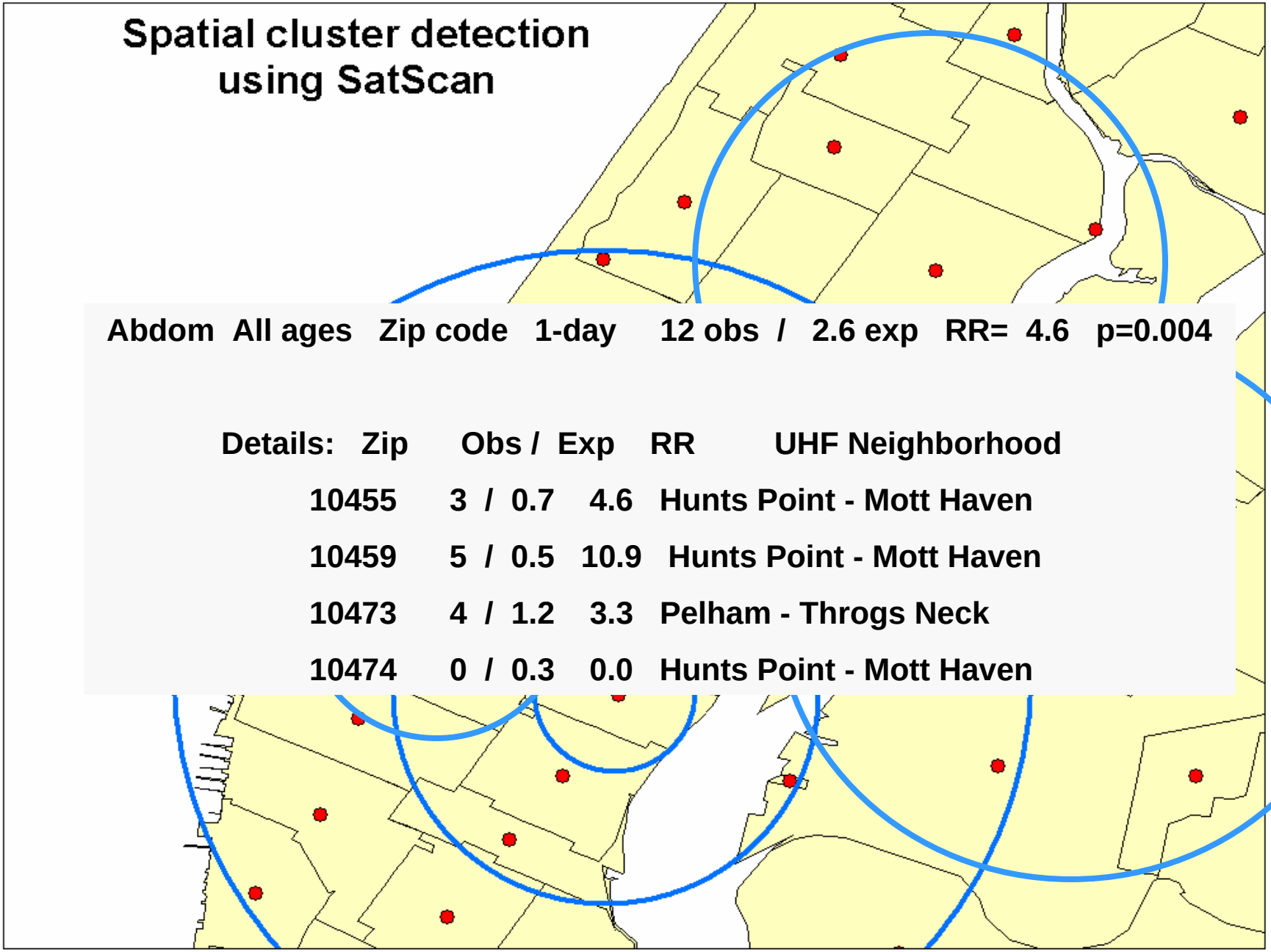


Employee Absenteeism- “flu”



Summary of citywide temporal signals

- Some clear seasonal patterns evident
- Sharp spikes associated with known events
- Difficult to investigate
- Used to reinforce public health messages (influenza, viral GI, heat wave, blackout)


Spatial cluster detection
using SatScan
Abdom All ages Zip code 1-day 12 obs / 2.6 exp RR= 4.6 p=0.004
Details: Zip Obs / Exp RR UHF Neighborhood
10455 3 / 0.7 4.6 Hunts Point - Mott Haven
10459 5 / 0.5 10.9 Hunts Point - Mott Haven
10473 4 / 1.2 3.3 Pelham - Throgs Neck
10474 0 / 0.3 0.0 Hunts Point - Mott Haven

Legal Mandate

Local health officers shall exercise due diligence in ascertaining the existence of outbreaks of illness or the unusual prevalence of diseases, and shall immediately investigate the causes of same

New York State Sanitary Code,
10 NYCRR Chapter 1, Section 2.16(a)

Guidelines for evaluating alarms

More concerning

Sustained increase

Multiple hospitals involved

Multiple syndromes

High number of cases

Other systems alarming

Strong geographic clustering

Coincident clinician call

Coincident with high profile public event

Less concerning

One-day increase

Single hospitals involved

Low number of cases

No other evidence

Diffuse increase across city

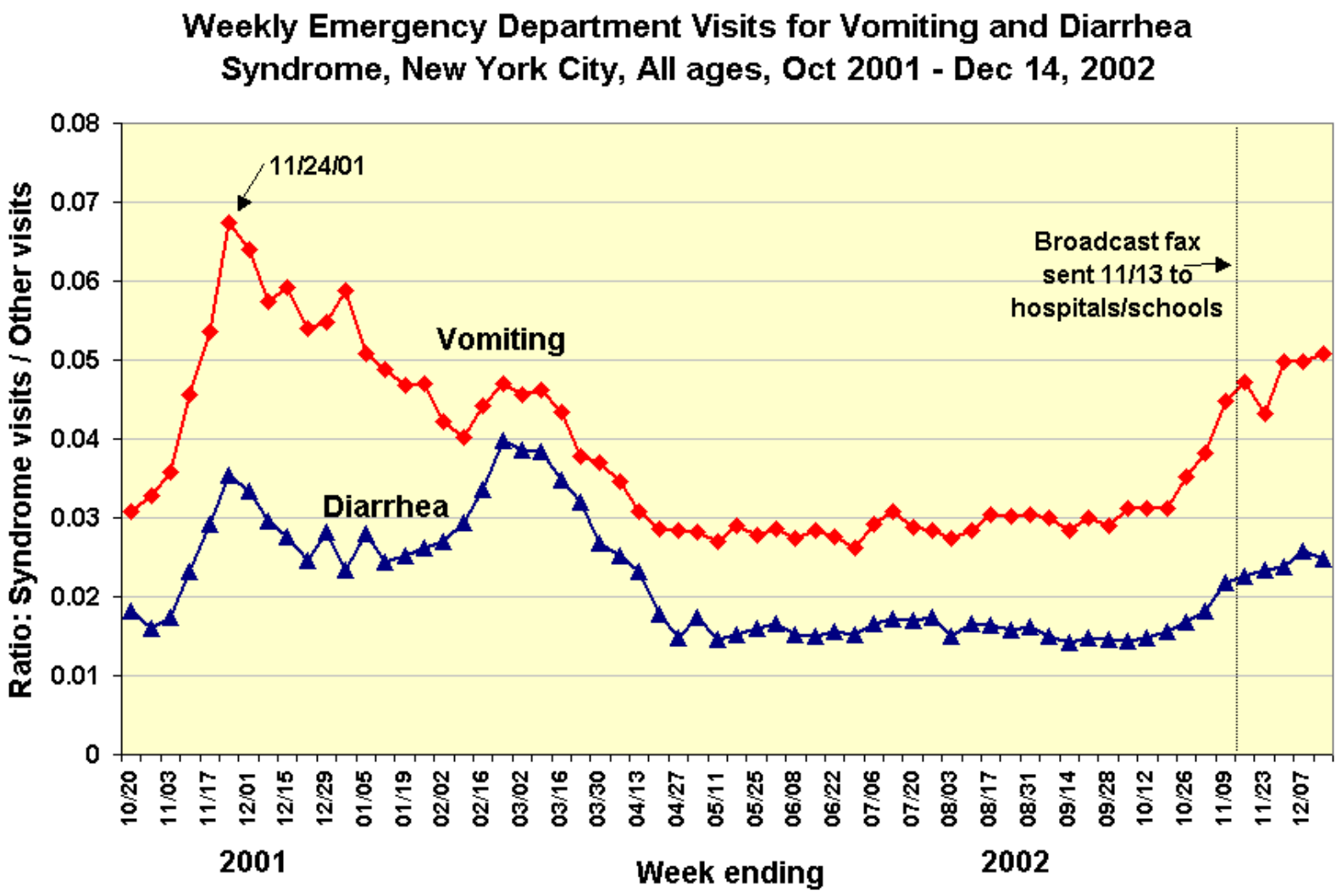
Investigation of signals

- Review line list
- Check complimentary systems
- Acquire interim data (12-hour log)
- Calls to ED(s), query clinicians, labs
- Chart reviews
- Patient follow-up
- Augment lab testing
- On site Epi teams

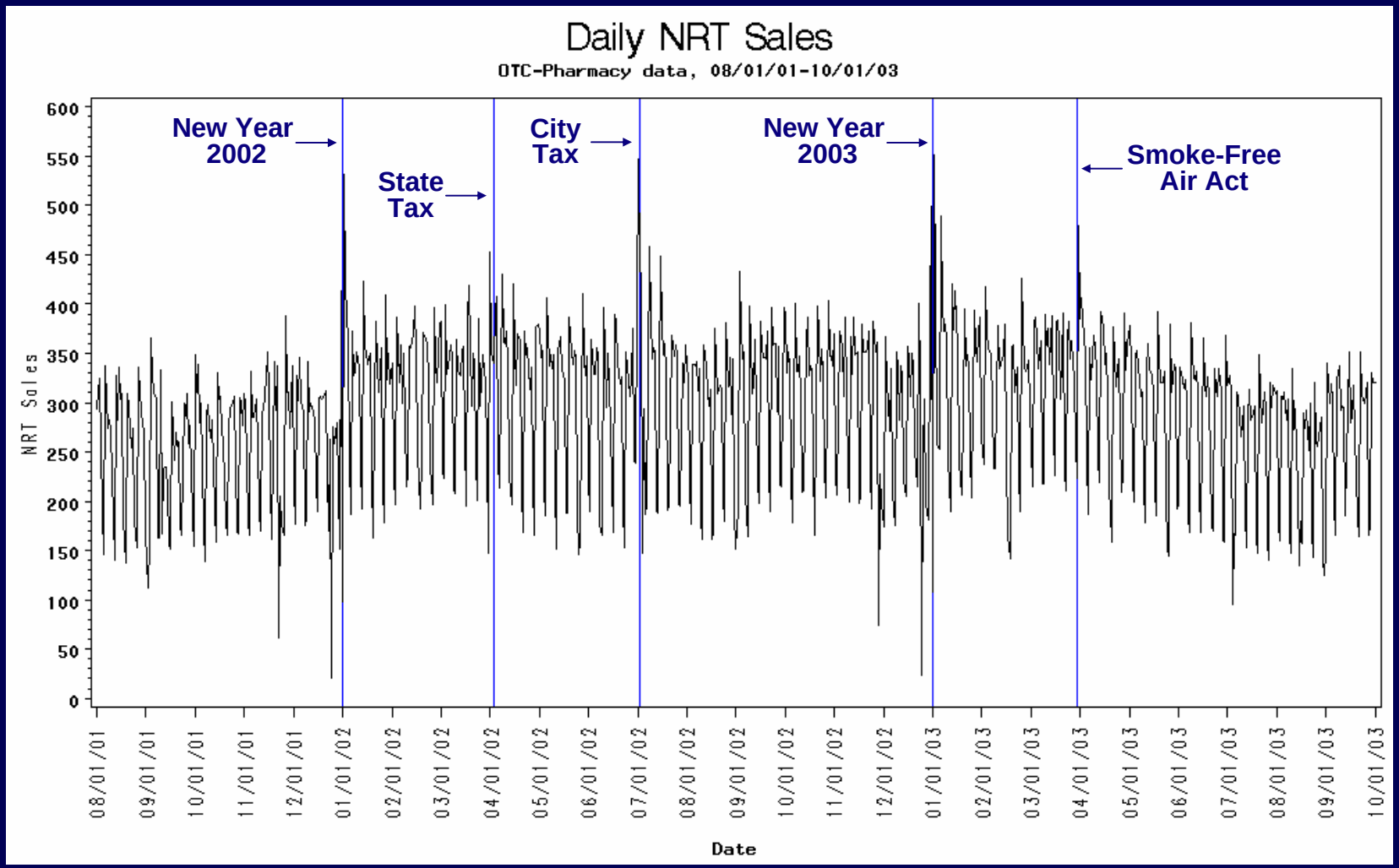
Is It Worth the Effort?

- Costs
  - Implementation costs are modest
  - Operational costs=time of public health staff, investigations
- Benefits
  - Possibility of huge benefit if early detection
  - Characterization
  - Strengthening traditional surveillance
  - Dual Use

Early warning of viral GI activity

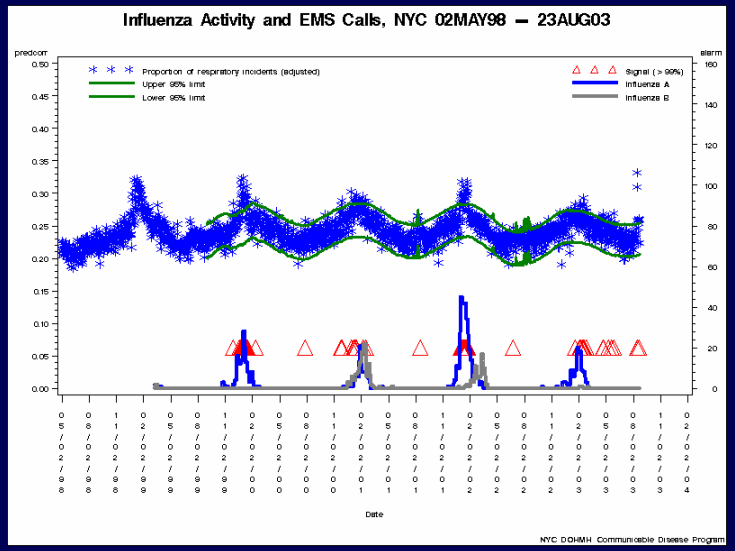


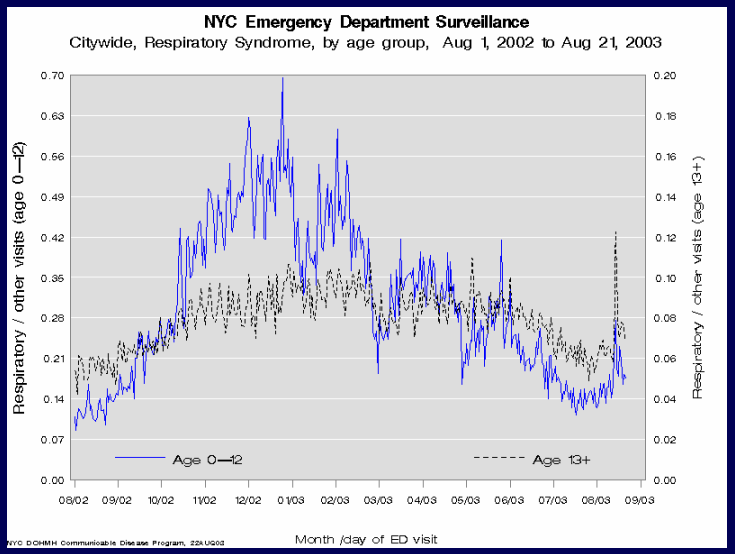
Increase in NRT sales concurrent with taxes/regulations?



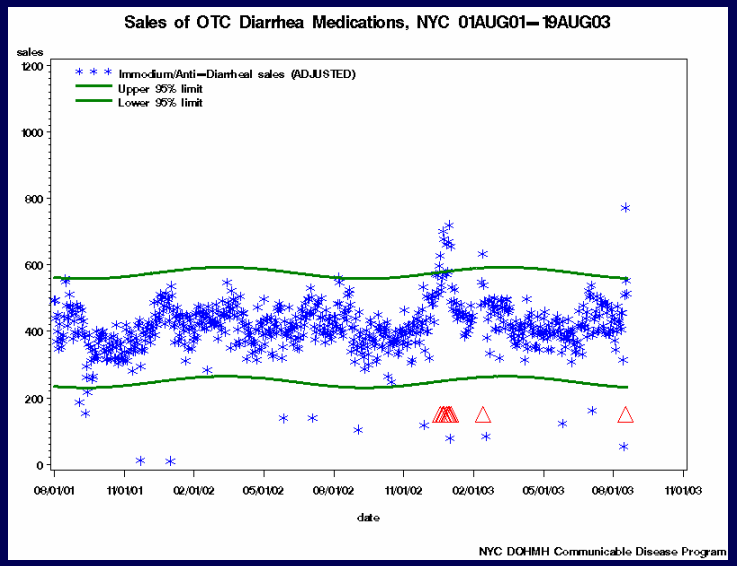
Blackout

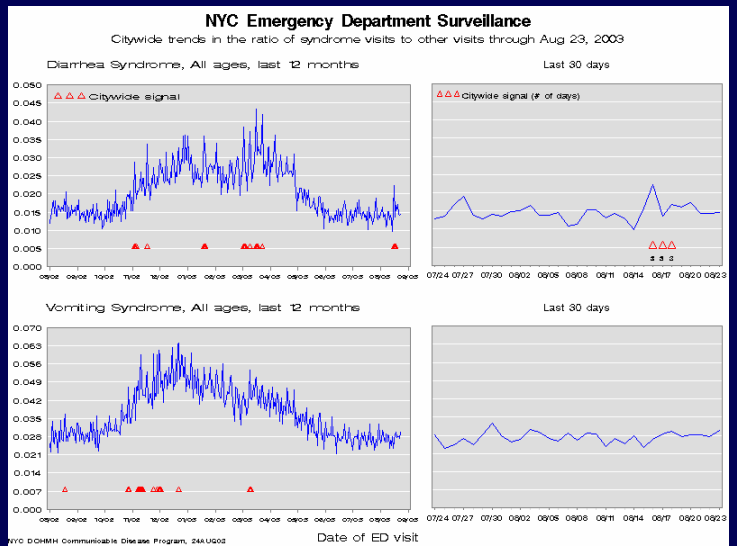
Respiratory



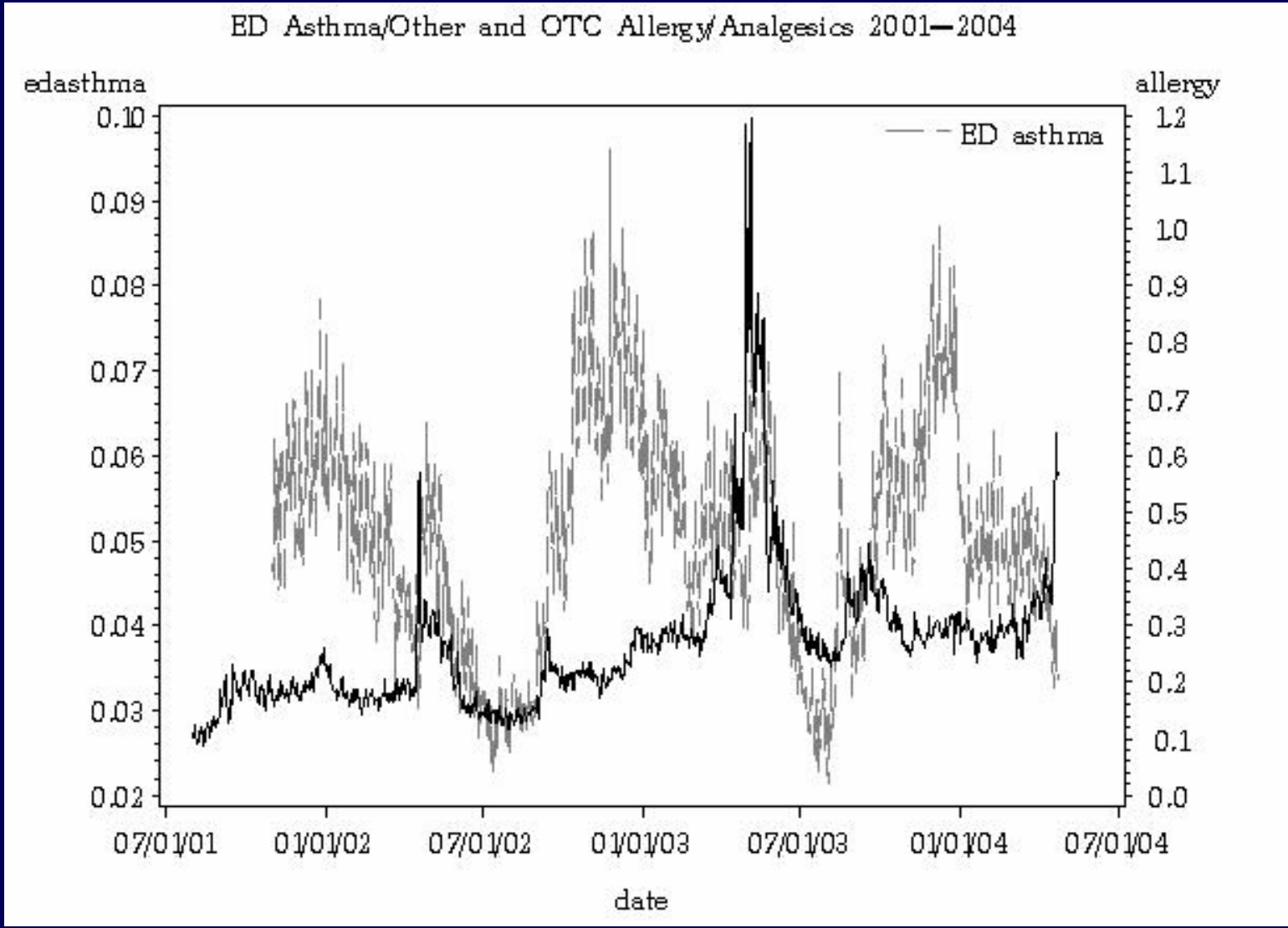


Gastrointestinal





Allergy Meds & Asthma Visits



Other Uses

- Case finding for measles outbreak
- Heat-related illness
- Cipro sales after anthrax
- Fireworks
- Dog bites/rat bites
- West Nile virus spraying
- Suicide attempts
- Overdoses
- Carbon monoxide poisoning

Valid Criticisms

- It doesn't work
- It's nothing new
- It's too expensive
- It's based on bad data
- It's too important to be left to LHDs
- It distracts us from real public health
- It's a flu surveillance system (not BT)
- It's a risk to confidentiality and privacy

Privacy and Confidentiality

- Health departments have strong tradition of maintaining security of confidentiality information
  - Public health provisions in HIPAA
- Data collected under auspices of bioterrorism surveillance de-linked from any identifiers for non-BT surveillance

So What?

- Strengthened surveillance systems in place
- Potential to better monitor all public health situations
- Even if there are no more bioterror attacks, preparation can strengthen our public health infrastructure and ability to respond

Which Data Source is Best?

- Readily Available
- Representative
- Timely
- Flexible
- Specific
- Investigable
- Good Signal-Noise

In NYC

- ED visit logs
- Ambulance Dispatch
- Local Pharmacy Chain
- National Pharm Data
- Absenteeism

How Many Illnesses Does One Emergency Visit Represent?

- Citywide random-digit dialed survey (n=2,445)
- Asked about GI, flu-like illness in past 30 days
- Health seeking behaviors among those with “flu”
  - 53% OTC
  - 33% missed work/school
  - 29% outpatient visit
  - 21% called MD office
  - 9% visited ED
- Uninsured more likely to be sick, but less likely to go to MD (15% vs 34%) or ED (7% vs 10%)

Primary Care Information Project

- Extend public health surveillance to the outpatient setting (esp CHCs)
  - More timely than ED
  - More specific, “investigable” than OTC
- Pilot usefulness of more detailed clinical data (vital signs, hematology, radiology)
- Catalyze extension of EMRs to other CHCs
- Provide HIPAA guidance

Future Steps

- Data Sources
  - Outpatient visit & EMR data
  - Lab orders
  - School sick visits
- Data Transport
  - Transition to PHIN-MS
- Data Analysis
  - Text normalization and coding
  - Multiple data sources
  - Integration with environmental surveillance
  - Outbreak “signatures”

Future Steps, cont.

- Investigation
  - Rapid specimen collection & diagnostic testing
- Evaluation & Validation
  - Simulated (synthetic) outbreaks
  - Systematic documentation of prospective surveillance
  - Sharing of experiences
  - www.syndromic.org
  - 2004 National Syndromic Surveillance Conference (Nov 3-4)

Acknowledgements

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NYC Health

Types of Surveillance

- Passive
- Active
- Registries
- Behavioral Surveillance (surveys)
- Secondary Data Analysis

- Syndromic?

Passive Surveillance

- Responsibility of reporters
- Pre-defined list of conditions
- Traditional limitations
  - Burden on providers
  - Under-reporting, incomplete data
  - Timeliness
- Electronic Clinical Lab Reporting System